8. Claims

While a few of the embodiments of the present invention have been explained, it will be readily apparent to those skilled in the art of the various modifications which can be made to the present invention without departing from the spirit and scope of this application as it is encompassed by the following claims.

What I claim as my invention is:

1. An apparatus for indication of internal overheat generated by a component of a machinery or a vehicle, the apparatus comprising at least:
    (a) a component of a machinery or a vehicle that generates internal heat in operation;
    (b) a high temperature zone in said component of the vehicle or machinery once said internal heat is generated;
    (c) a visible zone on exterior of said vehicle or machinery that is readily accessible for visual inspection;
    (d) a highly thermal conductive element embedded in the vehicle or machinery, with one end located adjacent to said high temperature zone and with the other end located in said visible zone;
    (e) an overheat indication assembly applied to the end of highly thermal conductive element located in the visible zone, said overheat indication assembly having at least one chemical coating that melts once a specific temperature is reached due to

excessive amount of internal heat being generated by said component of the vehicle or machinery.

2. The apparatus for indication of internal overheat, as recited in Claim 1, wherein the overheat indication assembly having a temperature indicating label comprising, in addition to the chemical coating,

(a) a paper to which the chemical coating is deposited, said paper being in a different color from the chemical coating and drawing the melted chemical coating into capillary holes in the paper once the specified temperature is reached;

(b) an adhesive backing and a transparent protective film that envelop the paper and the chemical coating, said adhesive backing being attached to the end of the highly thermal conductive element located in the visible zone.

3. The apparatus for indication of internal overheat, as recited in Claim 2, wherein the temperature indicating label is encapsulated and sealed to the end of the highly thermal conductive element located in the visible zone by a layer of additional adhesive.

4. The apparatus for indication of internal overheat, as recited in Claim 3, wherein the temperature indicating label has an additional transparent cover attached to the top by the additional adhesive, the additional transparent cover being thicker than the protective film.

5. The apparatus for indication of internal overheat, as recited in Claim 2, wherein the temperature indicating label having a plurality of different chemical coatings, each coating melts at a different temperature.

6. The apparatus for indication of internal overheat, as recited in Claim 1, wherein the highly thermal conductive element is a heat pipe means, providing a heat sink for the component of the machinery or the vehicle causing a fluid inside said heat pipe means to vaporize at the end of the heat pipe located adjacent to the high temperature zone and to condense at the end of the heat pipe located in the visible zone where the temperature is lower, therefore transferring the heat rapidly across the highly thermal conductive element with small temperature differential.

7. The apparatus for indication of internal overheat, as recited in Claim 1, wherein the component is a shaft / shaft bearing assembly in a rotary machinery or a vehicle.

8. The apparatus for indication of internal overheat, as recited in Claim 7, wherein the component is an axle / roller bearing assembly of a rail car wheel set, comprising at least an axle, a roller bearing mounted to the axle and a bearing adapter mounted onto the roller bearing.

9. The apparatus for indication of internal overheat, as recited in Claim 8, wherein

    (a) the axle / roller bearing assembly generates excessive amount of internal heat in case of failure;

(b) the high temperature zone lies in the section of the axle underneath the mounted roller bearing;

(c) the highly thermal conductive element is a cap screw mounted to the axle with end of the cap screw located adjacent to the high temperature zone and with head of the cap screw located in the visible zone.

(d) the overheat indication assembly mounted to the head of the cap screw includes a temperature indicating label that changes color at a specific temperature ranged between 200F and 500F.

(e) the temperature indicating label is encapsulated and sealed to the head of the cap screw by a layer of adhesive.

10. The apparatus for indication of internal overheat, as recited in Claim 8, wherein

(a) the axle / roller bearing assembly generates excessive amount of internal heat in case of failure;

(b) the high temperature zone lies in the section of the bearing adapter in close proximity to the roller bearing;

(c) the highly thermal conductive element is a label carrier mounted inside a hole in the bearing adapter with one end of the label carrier located in the high temperature zone and the other end located in the visible zone;

(d) the overheat indication assembly, mounted to the end of label carrier located in the visible zone, includes a temperature indicating label that changes color at a specific temperature ranged between 200F and 500F.

11. The apparatus for indication of internal overheat, as recited in Claim 1, wherein the component is a frictional component mounted on a shaft, said frictional component generates heat during frictional engagement.

12. The apparatus for indication of internal overheat, as recited in Claim 11, wherein the highly thermal conductive element is a heat pipe means, providing a heat sink for the frictional component in the machinery or the vehicle causing a fluid inside said heat pipe means to vaporize at the end of the heat pipe located in the high temperature zone and to condense at the end of the heat pipe located in the visible zone where the temperature is lower, therefore transferring the heat rapidly across the highly thermal conductive element with small temperature differential.

13. The apparatus for indication of internal overheat, as recited in Claim 11, wherein the frictional component is a railway wheel or a railway brake disc used for vehicle braking.

14. The apparatus for indication of internal overheat, as recited in Claim 13, wherein

(a) the highly thermal conductive element is a cap screw mounted to the railway wheel or railway brake disc with end of the cap screw located inside the wheel or the brake disc and head of the cap screw located in the visible zone;

(b) the overheat indication assembly mounted to the head of the cap screw includes a temperature indicating label that changes color at a specific temperature;

(c) the temperature indicating label is encapsulated and sealed to the head of the cap screw by a layer of adhesive.

15. The apparatus for indication of internal overheat, as recited in Claim 8, wherein said rail car wheel set with an axle / roller bearing assembly comprising at least,

(a) a railway wheel or a railway brake disc used for vehicle braking;

(b) an additional highly thermal conductive element embedded in the railway wheel or railway brake disc, with one end located inside the wheel or brake disc and with the other end located in the visible zone;

(c) an additional overheat indication assembly applied to the end of the additional highly thermal conductive element located in the visible zone, the additional overheat indication assembly having at least one chemical coating that melts once a specific temperature is reached due to the frictional heat generated from the railway wheel or railway brake disc, said additional overheat indication assembly helps to distinguish overheated axle / bearing assembly from overheated railway wheel or railway brake disc.

16. A method for indication of internal overheat generated by a component of a machinery or a vehicle, the method comprising at least:

(a) determining a high temperature zone in the vehicle or machinery once the component is overheated;

(b) selecting a visible zone on exterior of the vehicle or machinery that is readily accessible for visual inspection;

(c) embedding a highly thermal conductive element in the vehicle or machinery, with one end located in the high temperature zone and with the other end located in the visible zone;

(d) applying an overheat indication assembly to the end of highly thermal conductive element located in the visible zone, the overheat indication assembly having at least one chemical coating that melts once a specific temperature is reached due to excessive amount of internal heat being generated by said component of the vehicle or machinery.

17. The method for indication of internal overheat, as recited in Claim 16, wherein the overheat indication assembly having a temperature indicating label comprising, in addition to the chemical coating,

(a) a paper to which the chemical coating is deposited, said paper being in a different color from the chemical coating and drawing the melted chemical coating into capillary holes in the paper once the specified temperature is reached;

(b) an adhesive backing and a transparent protective film that envelop the paper and the chemical coating, said adhesive backing being attached to the end of the highly thermal conductive element located in the visible zone.

18. The method for indication of internal overheat, as recited in Claim 17, wherein the temperature indicating label is encapsulated and sealed to the end of the highly thermal conductive element located in the visible zone by a layer of additional adhesive.

19. The method for indication of internal overheat, as recited in Claim 18, wherein the temperature indicating label has an additional transparent cover attached to the top by the additional adhesive, the additional transparent cover being thicker than the protective film.

20. The method for indication of internal overheat, as recited in Claim 17, wherein the temperature indicating label having a plurality of different chemical coatings, each coating melts at a different temperature.

21. The method for indication of internal overheat, as recited in Claim 16, wherein the highly thermal conductive element is a heat pipe means, providing a heat sink for the component of the machinery or the vehicle causing a fluid inside said heat pipe means to vaporize at the end of the heat pipe located adjacent to the high temperature zone and to condense at the end of the heat pipe located in the visible zone where the temperature is lower, therefore transferring the heat rapidly across the highly thermal conductive element with small temperature differential.

22. The method for indication of internal overheat, as recited in Claim 16, wherein the component is a shaft / shaft bearing assembly in a rotary machinery or a vehicle.

23. The method for indication of internal overheat, as recited in Claim 22, wherein the component is an axle / roller bearing assembly of a rail car wheel set, comprising at least an axle, a roller bearing mounted to the axle and a bearing adapter mounted onto the roller bearing.

24. The method for indication of internal overheat, as recited in Claim 23, wherein

(a) the axle / roller bearing assembly generates excessive amount of internal heat in case of failure;

(b) the high temperature zone lies in the section of the axle underneath the mounted roller bearing;

(c) the highly thermal conductive element is a cap screw mounted to the axle with end of the cap screw located adjacent to the high temperature zone and with head of the cap screw located in the visible zone;

(d) the overheat indication assembly mounted to the head of the cap screw includes a temperature indicating label that changes color at a specific temperature ranged between 200F and 500F;

(e) the temperature indicating label is encapsulated and sealed to the head of the cap screw by a layer of adhesive.

25. The method for indication of internal overheat, as recited in Claim 23, wherein

(a) the axle / roller bearing assembly generates excessive amount of internal heat in case of failure;

(b) the high temperature zone lies in the section of the bearing adapter in close proximity to the roller bearing;

(c) the highly thermal conductive element is a label carrier mounted inside a hole in the bearing adapter with one end of the label carrier located in the high temperature zone and the other end located in the visible zone;

(d) the overheat indication assembly, mounted to the end of label carrier located in the visible zone, includes a temperature indicating label that changes color at a specific temperature ranged between 200F and 500F.

26. The method for indication of internal overheat, as recited in Claim 16, wherein the component is a frictional component mounted on a shaft, said frictional component generates heat during frictional engagement.

27. The method for indication of internal overheat, as recited in Claim 26, wherein the highly thermal conductive element is a heat pipe means, providing a heat sink for the frictional component in the machinery or the vehicle causing a fluid inside said heat pipe means to vaporize at the end of the heat pipe located in the high temperature zone and to condense at the end of the heat pipe located in the visible zone where the temperature is lower, therefore transferring the heat rapidly across the highly thermal conductive element with small temperature differential.

28. The method for indication of internal overheat, as recited in Claim 26, wherein the frictional component is a railway wheel or a railway brake disc used for vehicle braking.

29. The method for indication of internal overheat, as recited in Claim 28, wherein

(a) the highly thermal conductive element is a cap screw mounted to the railway wheel or railway brake disc with end of the cap screw located inside the wheel or the brake disc and head of the cap screw located in the visible zone;

(b) the overheat indication assembly mounted to the head of the cap screw includes a temperature indicating label that changes color at a specific temperature;

(c) the temperature indicating label is encapsulated and sealed to the head of the cap screw by a layer of adhesive.

30. The method for indication of internal heat, as recited in Claim 23, wherein said rail car wheel set with an axle / roller bearing assembly comprising at least,

(a) a railway wheel or a railway brake disc used for vehicle braking;

(b) an additional highly thermal conductive element embedded in the railway wheel or railway brake disc, with one end located inside the wheel or brake disc and with the other end located in the visible zone;

(c) an additional overheat indication assembly applied to the end of the additional highly thermal conductive element located in the visible zone, the additional overheat indication assembly having at least one chemical coating that melts once a specific temperature is reached due to the frictional heat generated from the railway wheel or

railway brake disc, said additional overheat indication assembly helps to distinguish overheated axle / bearing assembly from overheated railway wheel or railway brake disc.

31. The method for indication of internal overheat, as recited in Claim 25, wherein the label carrier has a spring pre-mounted to the end before installation of the label carrier inside the bearing adapter.